Prüfbericht-Nr.: *Test report no.:*	**DE24Z79Y 002**	**Auftrags-Nr.:** *Order no.*:	1171327 10	Seite 1 von 38 *Page 1 of 38*
Kunden-Referenz-Nr.: *Client reference no.*:	CPN0002 UL	**Auftragsdatum:** *Order date:*	2024-07-31	
Auftraggeber: *Client*:	Robert Bosch GmbH, Markwiesenstrasse 58, 72770 Reutlingen,Germany			
Prüfgegenstand: *Test item*:	Mini Remote			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	BRC3300			
Auftrags-Inhalt: *Order content*:	Prüfung der Funkparameter nach FCC & ISED *Test of radio parameters acc. to FCC & ISED*			
Prüfgrundlage: *Test specification*:	Teilprüfung/Partial test FCC CFR 47 Part 15 Subpart C- §15.247 ISED RSS-247:2023 Issue 3			

Wareneingangsdatum: *Date of sample receipt*:	2024-07-19
Prüfmuster-Nr.: *Test sample no:*	A003773899-001 to 010
Prüfzeitraum: *Testing period*:	2024-07-30 - 2024-08-06
Ort der Prüfung: *Place of testing*:	Nürnberg *Nuremberg*
Prüflaboratorium: *Testing laboratory:*	Wireless Labor *Wireless Test Lab*
Prüfergebnis*: *Test result**:	Pass

geprüft von: *tested by:*	X Signed by: Shrinivas Naikar	**genehmigt von:** *authorized by*:	X Signiert von: Matthias Kraeutlein
Datum: *Date:* 2024-09-12		**Ausstellungsdatum:** *Issue date:* 2024-09-12	
Stellung / Position:	Sachverständige(r)/Expert	**Stellung** / Position:	Sachverständige(r)/Expert

Sonstiges / *Other*: USA/FCC: C2PC filing for change in Transmit power level setting and adding a metal clip in new Device.

Dieser Prüfbericht DE24Z79Y -002 ersetzt den Prüfbericht DE24Z79Y -001 (siehe Änderungsverzeichnis) / The test report DE24Z79Y -002 replaces the test report DE24Z79Y -001 (see change history).

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery*: Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Produktbeschreibung
Product description

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.* *Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*
5	Wenn auf dem Bericht kein Akkreditierungshinweis aufgebracht ist, wurde der Bericht nicht im akkreditierten Bereich erstellt und ist folglich auch nicht vom EA MLA abgedeckt. Unabhängig davon wurde der Bericht auf Basis der allgemeinen Regeln der ISO/IEC 17000er Reihe erstellt. Mit "#" gekennzeichnete Prüfungen sind nicht Bestandteil der Akkreditierung D-PL-14169-03-00. *If there is no accreditation notice on the report, the report has not been produced in the accredited area and is consequently not covered by the EA MLA. Regardless of this, the report has been prepared based on the general rules of the ISO/IEC 17000 series. Tests marked with "#" are not covered by the accreditation D-PL-14169-03-00.*

Produktbeschreibung
Product description

1	**Test item**	Mini Remote
2	**Typ-No.**	BRC3300 (Tested)
3	**Identical Types**	BRC3310
4	**Test sample obtaining**	☒ Sampling by customer ☐ Sampling by TÜV Rheinland Group ☐ others:
5	**Serial-No.**	-
6	**Supported radio technologies** evaluated in this report	Bluetooth Low Energy
7	**Supported radio technologies** not evaluated in this report	None
8	**Description of EUT**	Sets up a BLE connection to transmit button press information to eBike.
9	**Max RF output power (measured)**	-4.8 dBm
10	**Operating Frequency (declared)**	BLE: 2402-2480MHz
11	**Channel Bandwidth (declared)**	BLE: 2MHz
12	**Number of Channels**	BLE: 40
13	**Modulation**	BLE: GFSK
14	**Rated Voltage / Frequency**	3V DC (Coin Cell Powered)
15	**FCC-ID (Radio module)**	2AWRC-BRC3300
16	**IC (Radio module)**	26294-BRC3300
17	**Antenna Name**	CERAMIC ANTENNA P/N: RFECA3216060A1T
18	**Radio Module / Antenna Type**	☒ Radio module with antenna on module PCB ☐ Radio module with dedicated antenna ☐ Radio module with user accessible antenna connector
19	**Radio Module Certification**	☒ Certified radio module ☐ Certified radio module with given antenna
20	**Antenna Type**	☒ Integral antenna (designed as a fixed part of the EUT) ☐ Dedicated antenna (removable, obligation to be used) ☐ Permanent antenna connector
21	**Antenna number of chains**	1
22	**Antenna Gain (declared)**	2 dBi
23	**Software / Firmware**	1.3.21
24	**Hardware**	1.2.2
25	**Provided Samples**	A003773899-001 to 010
26	**Conducted measurements sample**	A003773899-002
27	**Radiated measurements sample**	A003773899-001
28	**Companion Device** used for radio connection with the EUT	EUT in Test Mode. Therefore, no Companion Device was used.
29	**Auxiliary equipment** used to set up the EUT	PC with USB-to Serial adapter (Tüv Rheinland)
30	**Accessory Devices** used together with the EUT	-
31	**Temperature Range**	-20°C to +60°C
32	**Environment**	Indoor and Outdoor

Absatz *Clause*	**Anforderungen - Prüfungen /** *Requirements - Tests*	**Bemerkungen/** *Remarks*	**Ergebnis** *Result*
FCC 15.247 (a)(1) RSS-247 sec. 5.1	20 dB Bandwidth	Does not apply for FHSS equipment operating on the frequency range 2400-2483.5 MHz	P ☐ F ☐ N/A ☒ N/T ☐
FCC 15.247 (a)(1) RSS-247 sec. 5.1	Number of Hopping Frequencies	Does not apply for DTS equipment	P ☐ F ☐ N/A ☒ N/T ☐
FCC 15.247 (a)(1) RSS-247 sec. 5.1	Time of Occupancy	Does not apply for DTS equipment	P ☐ F ☐ N/A ☒ N/T ☐
FCC 15.247 (a)(1) RSS-247 sec. 5.1	Carrier Frequency Separation	Does not apply for DTS equipment	P ☐ F ☐ N/A ☒ N/T ☐
FCC 15.247 (b) RSS-247 sec. 5.4	Maximum Output Power	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.247 (e) RSS-247 sec. 5.2 (b)	Power Spectral Density	-	P ☐ F ☐ N/A ☐ N/T ☒
FCC 15.247 (a)(2) RSS-247 sec. 5.2 (a)	6dB Bandwidth	-	P ☐ F ☐ N/A ☐ N/T ☒
FCC 15.247 (d) RSS-247 sec. 5.5	Unwanted Emissions	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.207 RSS-Gen sec. 8.8	AC Power Conducted Emissions	Does not apply for equipment with DC supply voltage	P ☐ F ☐ N/A ☒ N/T ☐

Prüfdokumentation
Test documentation

Contents

Prüfdokumentation
Test documentation

1 Registration

The measurement facilities for conducted and radiated disturbance measurements of the TÜV Rheinland LGA Products have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules. Measurement data will be accepted in conjunction with applications for Certification under Parts 15 and 18 of the Commission's Rules.
FCC Registration Number: 939976
Bundesnetzagentur Registration Number: BNetzA-CAB-17/21-16
The measurement facilities are also recognized by Innovation, Science and Economic Development (ISED) Canada to test to Canadian radio equipment requirements.
Company Number: 11235A
CAB Identifier: DE0018

2 EUT Classification

2.1 Wireless technologies and frequencies supported by the EUT.

The named technologies are only those falling in the specification of the applied standard.

Technology	Frequency Range (TX)	TX Function	Supported by the EUT	Evaluated in this report
802.11b	2400 – 2483.5 MHz	SISO	☐	☐
802.11g	2400 – 2483.5 MHz	SISO	☐	☐
802.11n (20MHz)	2400 – 2483.5 MHz	SISO	☐	☐
802.11n (40MHz)	2400 – 2483.5 MHz	SISO	☐	☐
BLE 5.0	2400 – 2483.5 MHz	SISO	☒	☒
Non-specific SRD	2400 – 2483.5 MHz	SISO	☐	☐

SISO: Single Input Single Output

2.2 Standard specific classification of the EUT

2.2.1 Applied standards.

FCC CFR 47 Part 15 Subpart C - §15.247
ISED RSS-247:2023 Issue 3

2.2.2 Test Methods and Guidance Documents

ANSI C63.10:2013
KDB 558074 D01 DTS Measurement Guidance v05
KDB 996369 D04 Module Integration Guide v01

2.3 System Type

DTS (Digital Transmission System)

2.3.1 Type of equipment

Equipment that can be used in multiple orientations

3 Test conditions and configurations.

3.1 Normal environmental test conditions

Environmental condition	Parameter	Range during test
Temperature	°C	21-24
Relative humidity	%	20-60
Supply voltage	V DC(Battery Operated)	3

3.2 Equipment modifications

No modifications were found to be necessary to perform the tests or to achieve compliance.

3.3 Antenna assemblies

EUT is equipped with a standard antenna connector, so tests were done in conducted and radiated mode.

3.4 Test Modes

The EUT was rotated in all orientations (elevation and azimuth) with the help of a positioning device.

Following configurations were used for the test cases:

3.5 Test modes

Mode description	Mode configuration
All Modes	The auxiliary equipment was connected to the EUT during the tests. The USB Cable was grounded and filtered at the point of feed-trough.
Mode 1: TX-Mode; worst-case modulation	BLE continues transmission was enabled on Low Channel 2402MHz, Mid Channel 2440MHz and High Channel 2480MHz, and the Transmit Power setting -4dBm, 1Mbps, 2Mbps GFSK Modulation (PRBS9) used for the radio configuration. The nRF Connect test tool was used for the BLE configuration.
Mode 2: RX-Mode	-

3.6 Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to ETSI TR 100 028-1/-2 and ETSI TS 103 051 (radiated measurements) and is documented in the quality system acc. to ISO/IEC 17025:2017.
Furthermore, component and process variability of devices similar to that tested may result in additional deviation.
The stated values are the expanded uncertainty values, the measured value lies within the assigned range of values with a probability of 95% (k = 1.96).
The manufacturer has the sole responsibility of continued compliance of the device.

Test	Value	Unit	Range
Frequency Error	2.7 *10^{-8}	Hz	-
Frequency Stability under low voltage conditions			
Time	1.1*10^{-9}	s	-
Conducted Carrier Power Conducted Spurious Emissions (RX/TX)	1.0	dB	9k-1GHz
	1.7	dB	1GHz-6GHz
	2.8	dB	6GHz-40GHz
Occupied Bandwidth (OBW)	0.1	%	-
TX Power Spectral Density	4.2	mW	9kHz - 6GHz
	1.6	dB	9kHz - 6GHz
Dwell Time	4.6 *10^{-7}	Hz	-
Frequency Separation			-
Measurement of conducted emissions at the power supply connection to LISN	2.3	dB	9kHz – 150kHz
	2.2	dB	150kHz – 30MHz
Measurement of the field strength at distance 3m	1.6	dB	9k-150kHz
	4.5	dB	30-1000MHz
	5	dB	1-6GHz
	5.3	dB	6-40GHz
Temperature	0.8	K	-
Humidity	4	%	-
Voltage (AC/DC)	1.0	%	-

4 Test results in detail

4.1 Maximum Output Power

4.1.1 Requirements / Limits

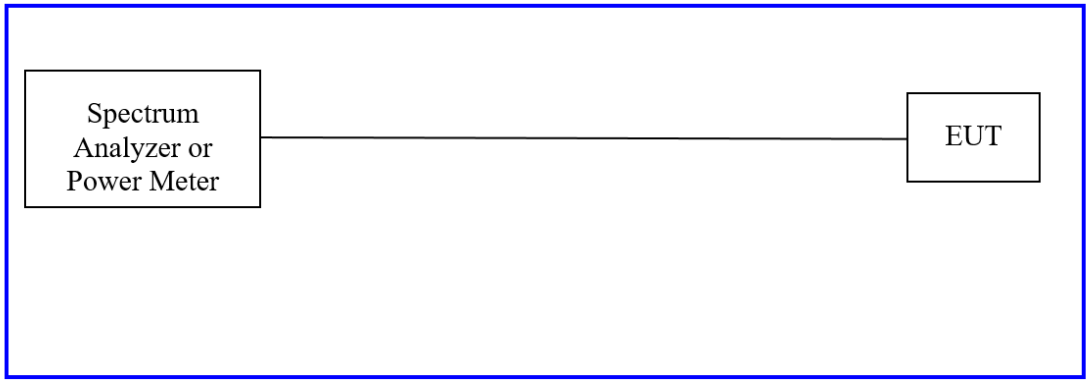
The maximum output power limit is expressed in terms of either maximum peak conducted output power or maximum conducted output power.
The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the full signal bandwidth.
The maximum conducted output power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level.

	Condition		Limit
☒	Systems using digital modulation techniques in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands		*FCC Part 15, Subpart C, §15.247 (b) (3)* 1 watt = 30dBm. Maximum conducted peak output power: 30 dBm (excluding antenna gain, if antennas with directional gains that do not exceed 6 dBi are used).
☐	Frequency hopping systems operating 2400-2483.5 MHz band.	Employing less than 75 non-overlapping hopping channels	*FCC Part 15, Subpart C, §15.247 (b) (1)* 0.125 watt = 21dBm.
☐		Employing at least 75 non-overlapping hopping channels	*FCC Part 15, Subpart C, §15.247 (b) (1)* 1 watt = 30dBm.
☐	Frequency hopping systems operating 5725-5850 MHz band.		*FCC Part 15, Subpart C, §15.247 (b) (1)* 1 watt = 30dBm.
☐	Frequency hopping systems operating 902-928 MHz band.	Employing less than 50 but at least 25 hopping channels	*FCC Part 15, Subpart C, §15.247 (b) (2)* 0.25 watt = 24dBm.
☐		Employing at least 50 hopping channels	*FCC Part 15, Subpart C, §15.247 (b) (2)* 1 watt = 30dBm
☐	Antenna gain greater than 6dBi		*FCC Part 15, Subpart C, §15.247 (b) (4)* The conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3), as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi

4.1.2 Test Method (Maximum Output Power)

4.1.2.1 Conducted measurements.

Measurements were done according to ANSI C63.10:2013 clause 11.9.1.1 peak power (RBW > DTS bandwidth).
The EUT was connected to the spectrum analyzer or Power Meter via a coax cable with a known loss.



4.1.3 Test setup (Maximum Output Power)

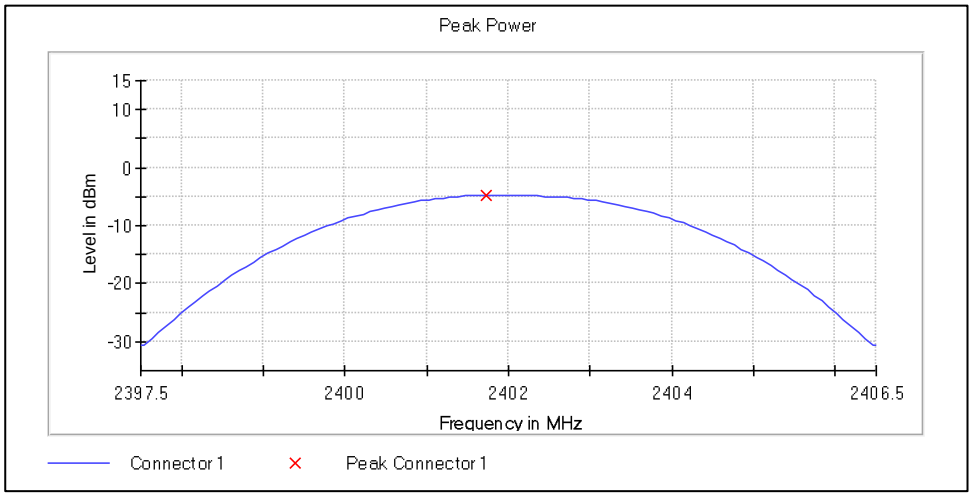
4.1.3.1 Conducted measurements.

EUT		A003773899-002
Chamber details		Shielded room
Companion device		EUT in Test Mode. Therefore, no Companion Device was used.
Operation mode		☒ 1: TX-Mode; worst-case modulation ☐ 2: RX-Mode ☐ 3: TX-Modes for worst case evaluation ☐ 4: N/A
Spectrum Analyzer	**Resolution Bandwidth**	3MHz
	Video Bandwidth	10MHz
	Sweep Time	1,271µs (Max Hold until stable)
	Detector	Peak
Further parameters		-
Test engineer		Shrinivas Naikar

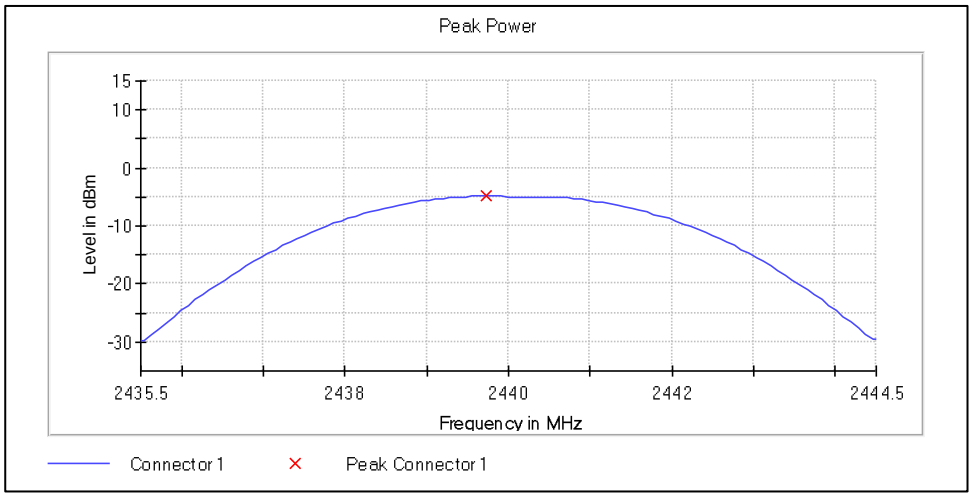
4.1.4 **Test results** (Maximum Output Power)

4.1.4.1 **Conducted measurements.**

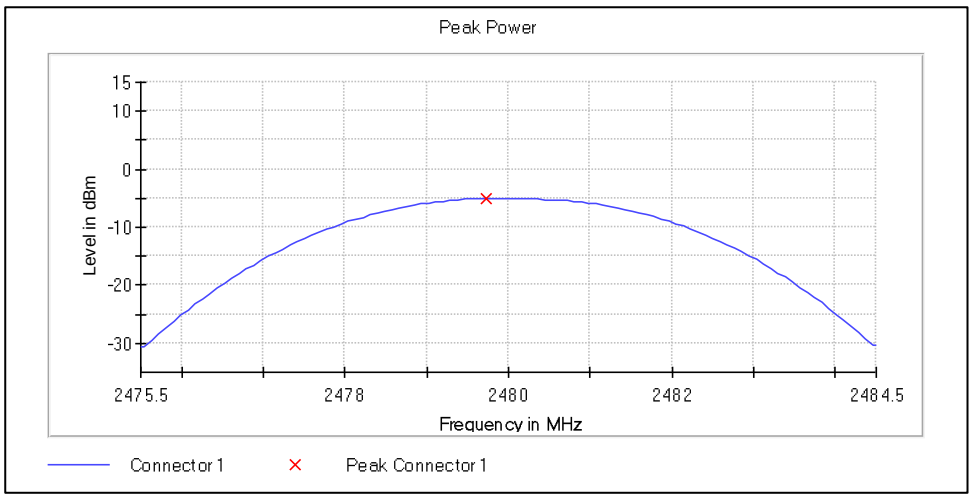
4.1.4.1.1 Lowest Channel 1Mbps



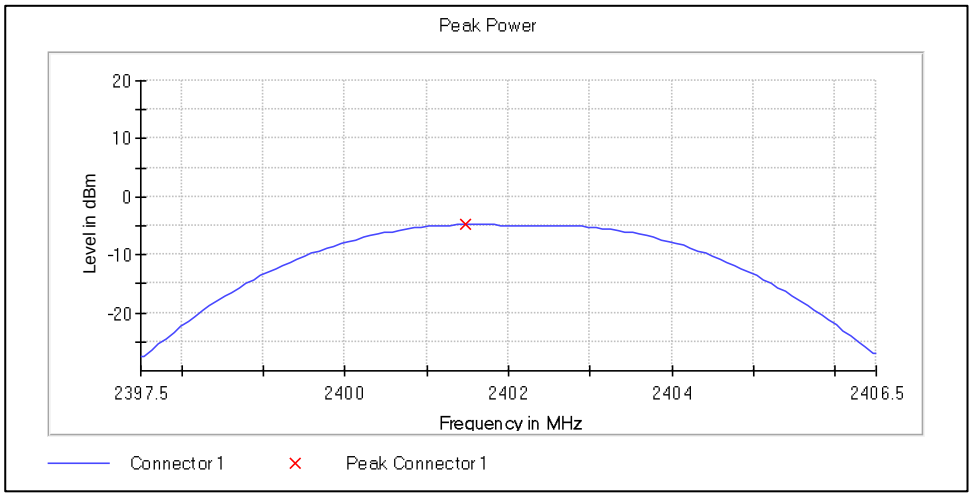
4.1.4.1.2 Middle Channel 1Mbps



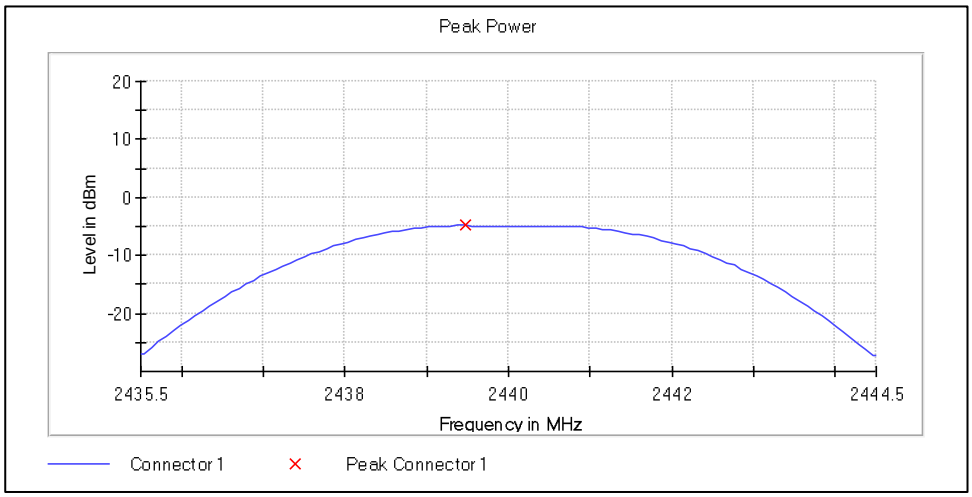
4.1.4.1.3 Highest Channel 1Mbps



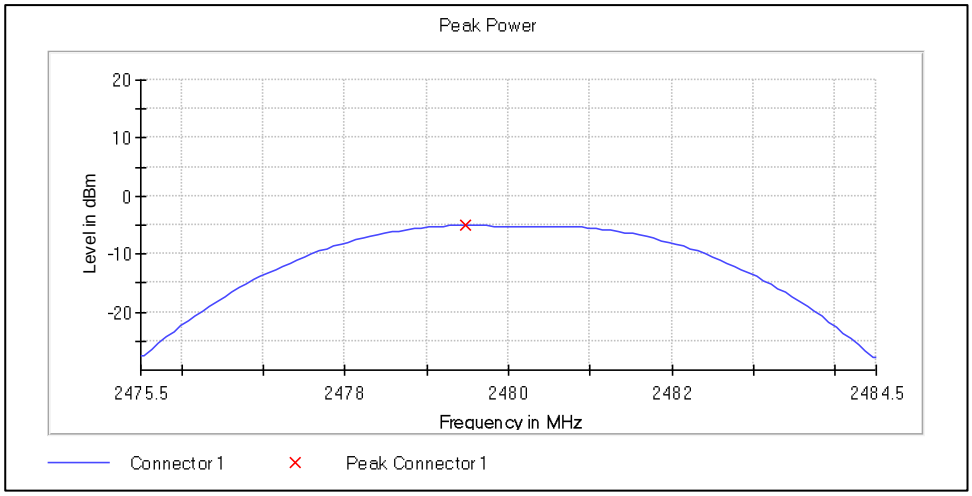
4.1.4.1.4 Lowest Channel 2Mbps



4.1.4.1.5 Middle Channel 2Mbps



4.1.4.1.6 Highest Channel 2Mbps



Prüfdokumentation
Test documentation

4.1.4.1.7 **Conducted measurements summary** (Maximum Output Power)

Frequency (MHz)	Data Rate (Mbps)	Peak conducted output power (dBm)	Limit (dBm)	Margin (dB)	Test Result
2402	1	-4.8	30	25.2	Pass
2440		-4.8		25.2	Pass
2480		-5.1		24.9	Pass
2402	2	-4.8	30	25.2	Pass
2440		-4.8		25.2	Pass
2480		-5.1		24.9	Pass

4.1.5 **Final test result** (Maximum Output Power)

Measured overall (equivalent) conducted Maximum Output Power: -4.8 dBm

Final test result	Pass

4.2 Unwanted emissions

4.2.1 Requirements / Limits

☒	FCC Part 15, Subpart C, §15.247 (d); [RSS-247 sec. 5.5]: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) [RSS-Gen sec. 8.9] is not required. Radiated emissions which fall in the restricted bands, as defined in § 15.205(a) [RSS-Gen sec.8.10], must comply with the radiated emission limits specified in § 15.209(a) [RSS-Gen sec. 8.9].
☐	FCC Part 15, Subpart C, §15.247 (d); [RSS-247 sec. 5.5]: If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this test shall be 30 dB instead of 20 dB.

FCC Part 15, Subpart C, §15.209; [RSS-Gen sec. 8.9]; Radiated Emission Limits

Frequency [MHz]	Measurement distance [m]	Limit [µV/m]	Limits [dBµV/m]	Limits @3m [dBµV/m]
0.009 – 0.49	300	2400/F(kHz)	48.5 … 13.8	128.5 … 93.8
0.49 – 1.705	30	24000/F(kHz)	33.8 … 23.0	73.8 … 63.0
1.705 – 30	30	30	29.5	69.5
30 – 88	3	100	40.0	40.0
88 – 216	3	150	43.5	43.5
216 – 960	3	200	46.0	46.0
960 - 40000	3	500	54.0	54.0

Used conversion factor µV/m->dBµV/m: $\text{Limit}\,[\text{dB}\mu\text{V/m}] = 20\log(\text{Limit}\,[\mu\text{V/m}] / 1\mu\text{V/m})$
At frequencies below 30MHz, the measured values are corrected with an inverse linear distance extrapolation factor (40dB/decade) according to FCC 15.31 (f)(2).

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90kHz, 110–490kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing a linear average detector.

FCC Part 15, Subpart C, §15.35(b) [RSS-Gen sec. 8.1]:
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

ANSI C63.10:2013 clause 5.5:
The spectrum shall be investigated from the lowest radio frequency signal generated in the device and up to at least the frequency shown in Table 2. However, frequencies below 9 kHz do not need to be investigated.

Table 2—Frequency range of measurements for unlicensed wireless device

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

4.2.2 Radiated measurements with general limit (Unwanted emissions)

4.2.2.1 Test Method

Radiated unwanted Emissions were tested against the general limits specified in § 15.209(a) [RSS-Gen sec. 8.9]. Emissions that fall inside the frequency band in which the intentional radiator is operating were excluded.
Emissions that exceed the general limits were additionally tested for the further requirements of §15.247 (d); [RSS-247 sec. 5.5]

For integration measurements, the transmit frequency, including fundamental components of modulation is not tested, as this is modulation-dependent and is assumed not to be affected by the integration.

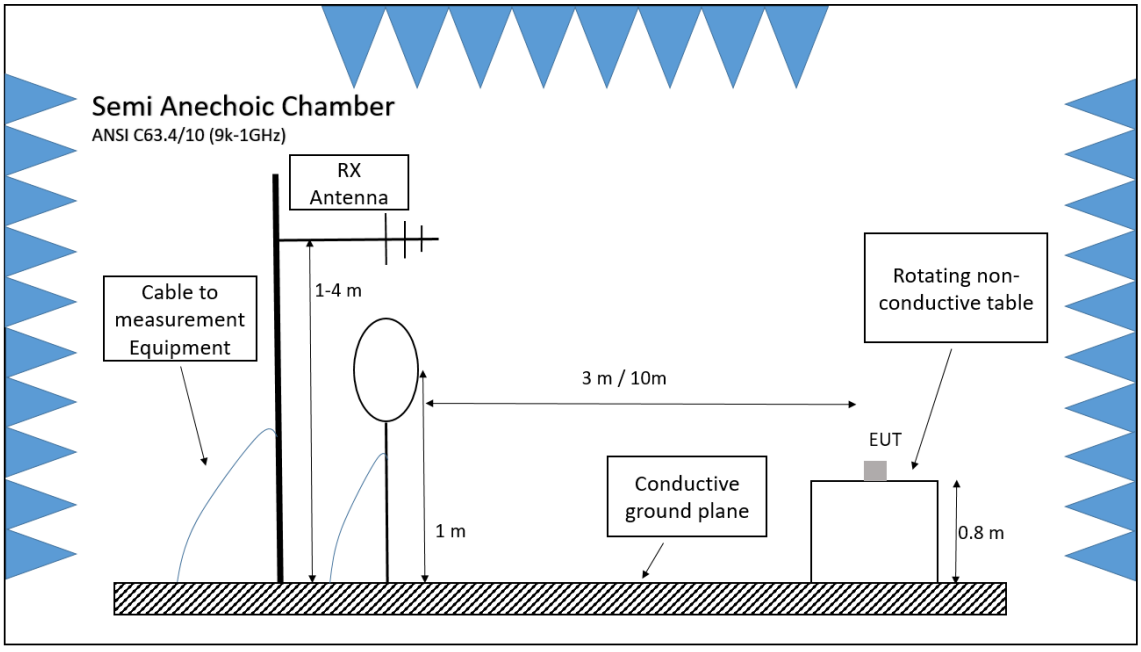
A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT. The different measurement setups for each frequency range are shown below.

For the final testing, the placement of EUT and cables were the same as for preliminary testing. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked. For the measurements in the frequency range 30 MHz to 1 GHz for each measured frequency the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation.

For measurement above 1 GHz the turntable and positioner step sizes were set to a range of 45° and the antenna height is fixed.

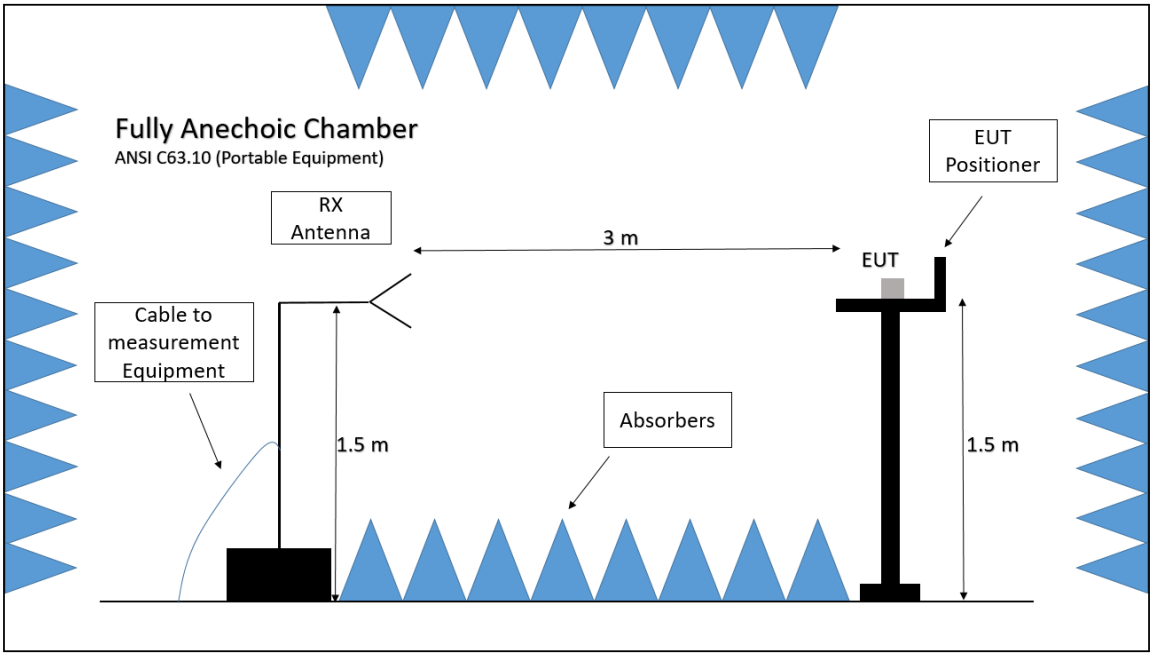
4.2.2.2 **EUT positioning** (Radiated measurements with general limit; Unwanted emissions)

4.2.2.2.1 EUT positioning below 1GHz



Prüfdokumentation
Test documentation

4.2.2.2.2 EUT positioning above 1GHz; portable Device



4.2.2.3 Measurement Setup (Radiated measurements with general limit; Unwanted emissions)

4.2.2.3.1 Measurement Setup 9kHz - 30MHz

Test Site	SAC (Semi Anechoic Chamber)
Receiving Antenna	Loop antenna (HFH 2)
Receiving Antenna Height	1m (center of Loop antenna)
Receiving Antenna Polarization	Parallel and perpendicular to the EUT (EUT without Loop antenna) According to ANSI C63.10:2013 clause 6.4.6
EUT Table	1.0m x 1.5m non-conductive table 80cm above the floor
EUT Turn Table Step Size	22.5° during exploratory tests Linear during maximizations for final measurements
Receiver Configurations	Average and peak detectors (9-90kHz and 110-490kHz) Quasi Peak detector (90-110kHz and 490kHz-30MHz)
	RBW: 200Hz (9 - 150kHz) and 9 kHz (150kHz – 30MHz)
	Step Size: 50Hz (9-150kHz) and 2.25kHz (150k-30MHz)
	Sweep Time: 100ms (FFT) during exploratory tests Sweep Time: 1s for final measurements

4.2.2.3.2 Measurement Setup 30MHz - 1GHz

Test Site	Semi-anechoic chamber
Receiving Antenna	Hybrid Antenna VULB 9168
Receiving Antenna height	Varied (1m to 4m, step size 1m) during exploratory tests Linear during maximizations for final measurements
Receiving Antenna Polarization	Horizontal and Vertical
EUT Table	1.0m x 1.5m non-conductive table 80cm above the floor
EUT Turn Table Step Size	45° during exploratory tests Linear during maximizations for final measurements
Receiver Configurations	Average and peak detector
	RBW :120 kHz
	Step Size: 30kHz (30-1000MHz)
	Sweep Time: 100ms (FFT) during exploratory tests Sweep Time: 1s for final measurements

4.2.2.3.3 Measurement Setup above 1GHz

Test Site	Fully-anechoic chamber
Receiving Antenna	Horn Antenna HF907 (1-18GHz), 3116C-PA (18-40GHz)
Receiving Antenna Height	1.5m
Receiving Antenna Polarization	Horizontal – Vertical
EUT Positioner	40cm x 60cm non-conductive positioner 1.5m above the floor Step size elevation angle 45°
EUT Turn Table Step Size	Continues
Spectrum Analyzer	Average and peak detectors
	RBW: 1 MHz
	Sweep Time: 60s during exploratory tests Sweep Time: 10s for final measurements

4.2.2.4 Test Setup (Radiated measurements with general limit; Unwanted emissions)

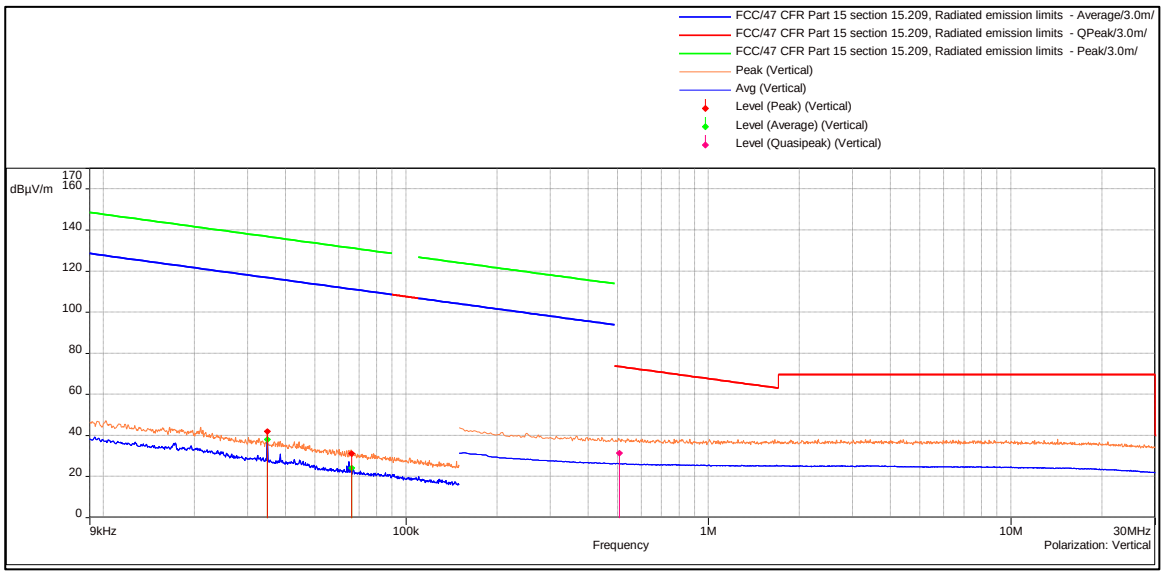
EUT	A003773899-001
Companion device	EUT in Test Mode. Therefore, no Companion Device was used.
Operation mode	☒ 1: TX-Mode; worst-case modulation ☐ 2: RX-Mode ☐ 3: TX-Modes for worst case evaluation ☐ 4: N/A
Further parameters	-
Test engineer	Shrinivas Naikar

Prüfdokumentation
Test documentation

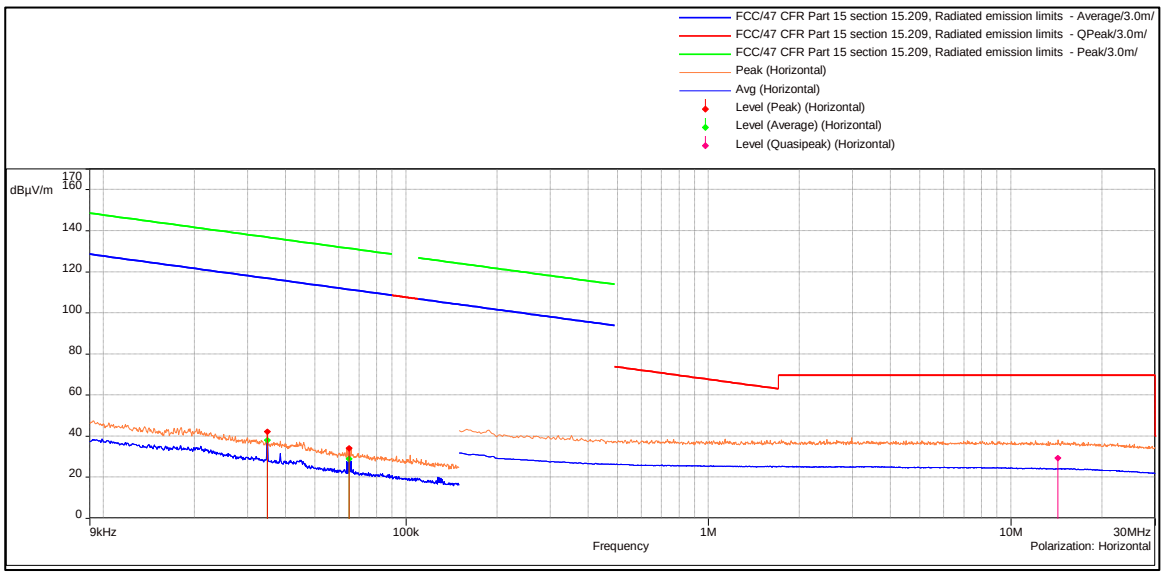
4.2.2.5 **Worst case Test results** (Radiated measurements with general limit; Unwanted emissions)

4.2.2.5.1 9 kHz to 30 MHz, lowest Channel 1Mbps

Perpendicular Polarization



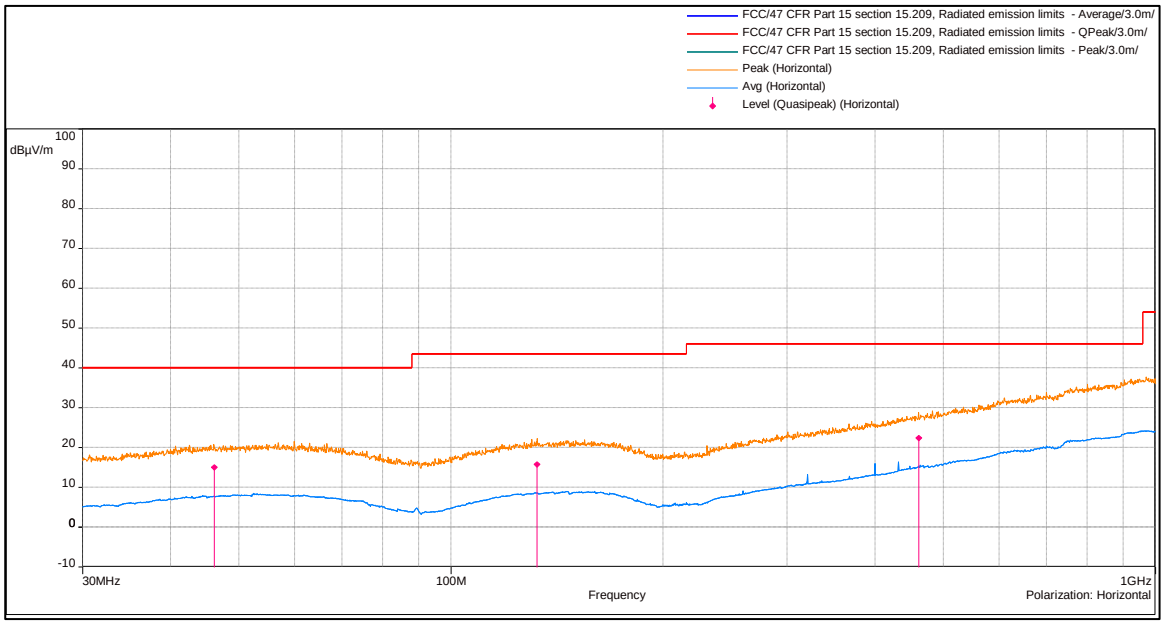
Parallel Polarization



Prüfdokumentation
Test documentation

4.2.2.6 30 MHz to 1 GHz, lowest Channel 1Mbps

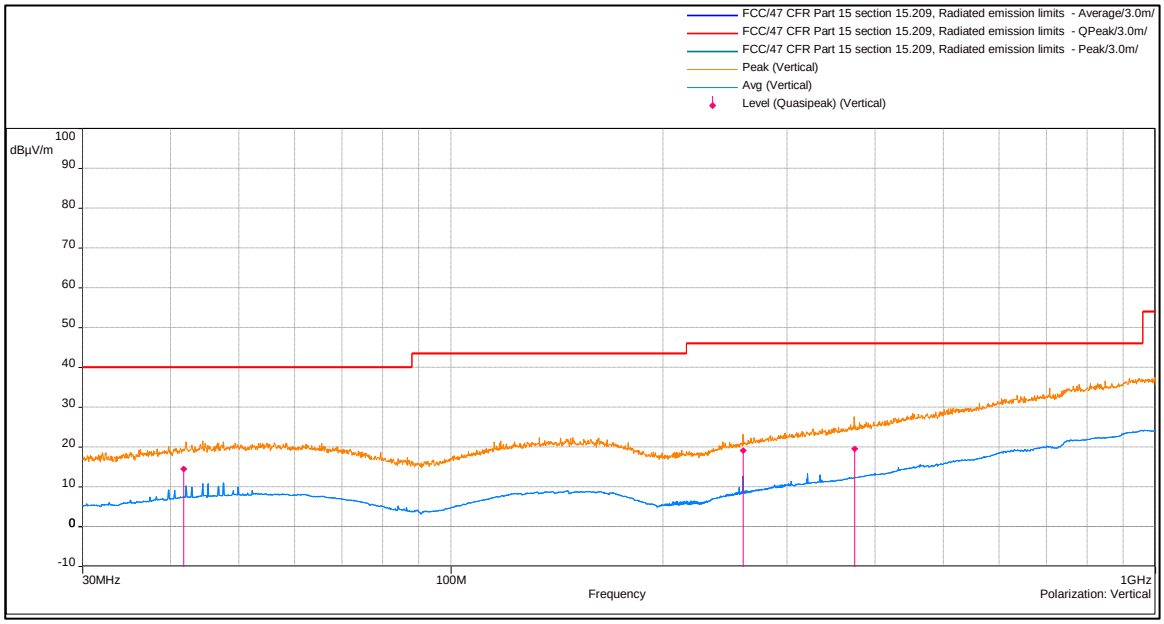
4.2.2.6.1 Horizontal Polarization



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Azimuth (deg)	Height (m)	Corr. (dB)
46.125	15.01	40.00	-24.99	Horizontal	59.50	4.00	20.63
132.35	15.82	43.50	-27.68	Horizontal	181.00	2.00	19.84
461.175	22.44	46.00	-23.56	Horizontal	10.70	2.95	26.53

Prüfdokumentation
Test documentation

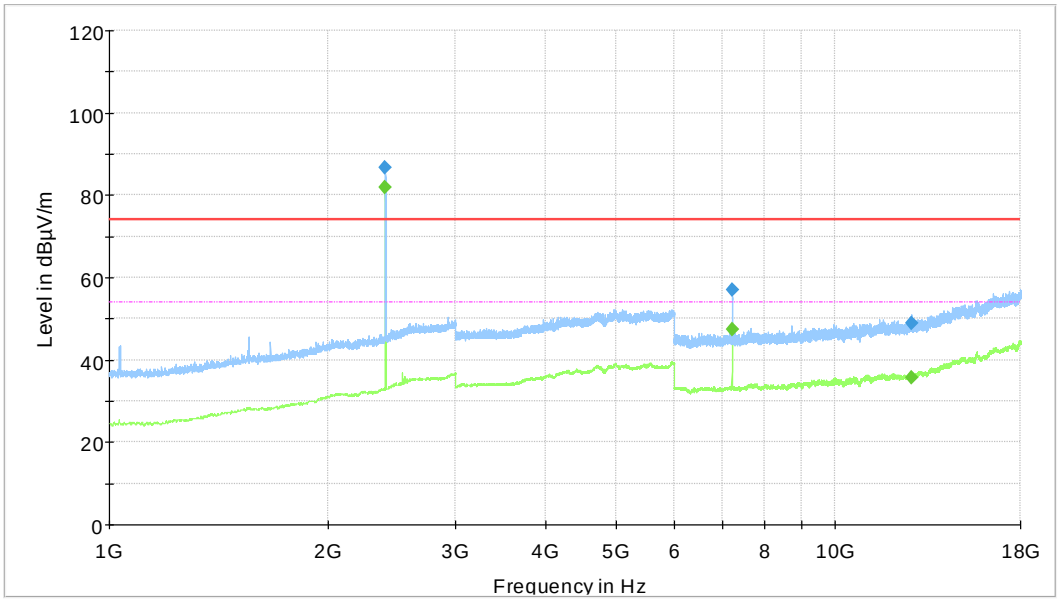
4.2.2.6.2 Vertical Polarization

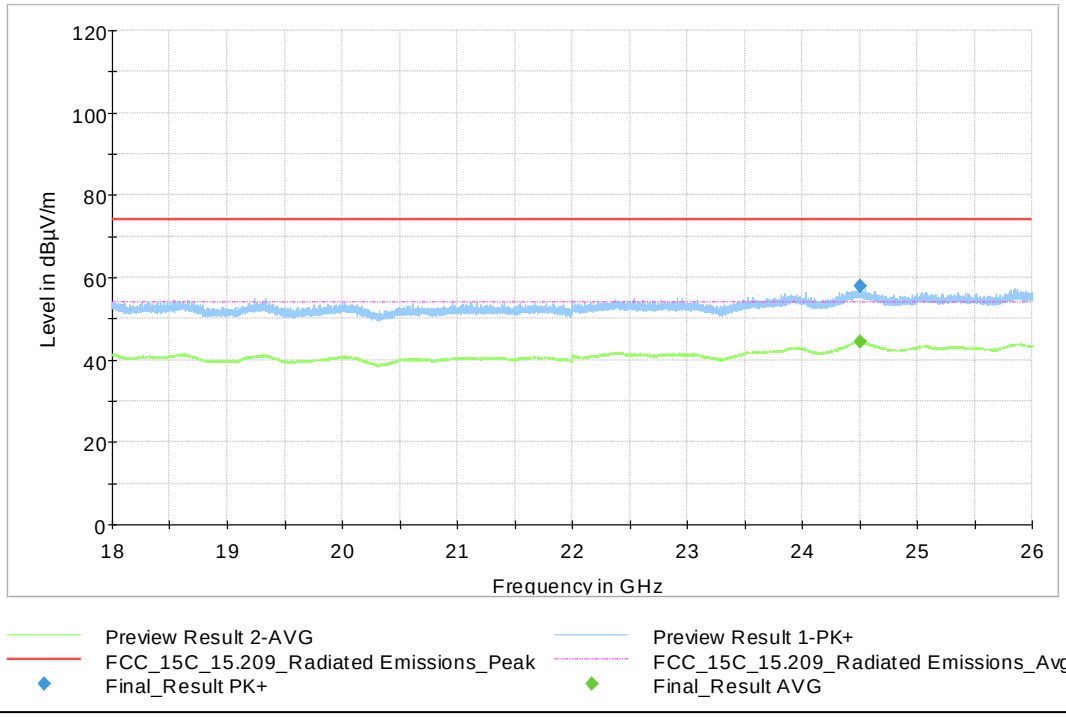


Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Azimuth (deg)	Height (m)	Corr. (dB)
41.725	14.59	40.00	-25.41	Vertical	238.90	4.00	20.28
259.875	19.21	46.00	-26.79	Vertical	33.50	1.02	20.33
374.05	19.56	46.00	-26.44	Vertical	39.30	3.56	23.87

Prüfdokumentation
Test documentation

4.2.2.7 1 to 26GHz, Lowest Channel 1Mbps

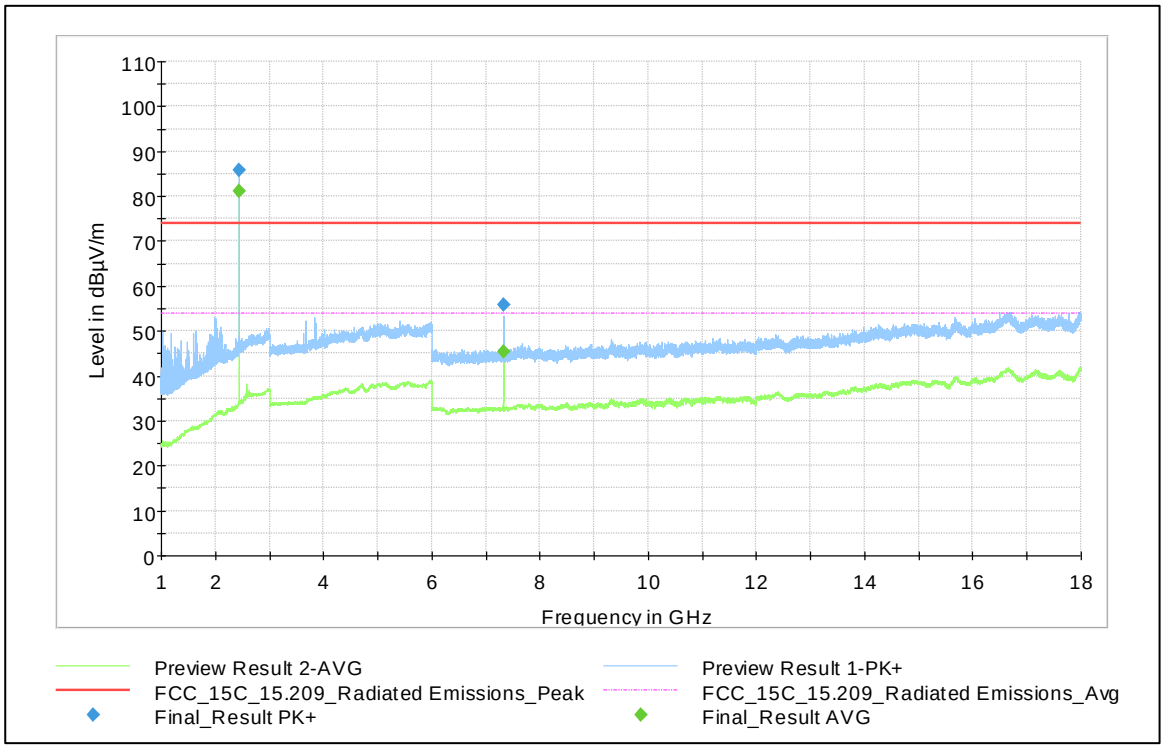




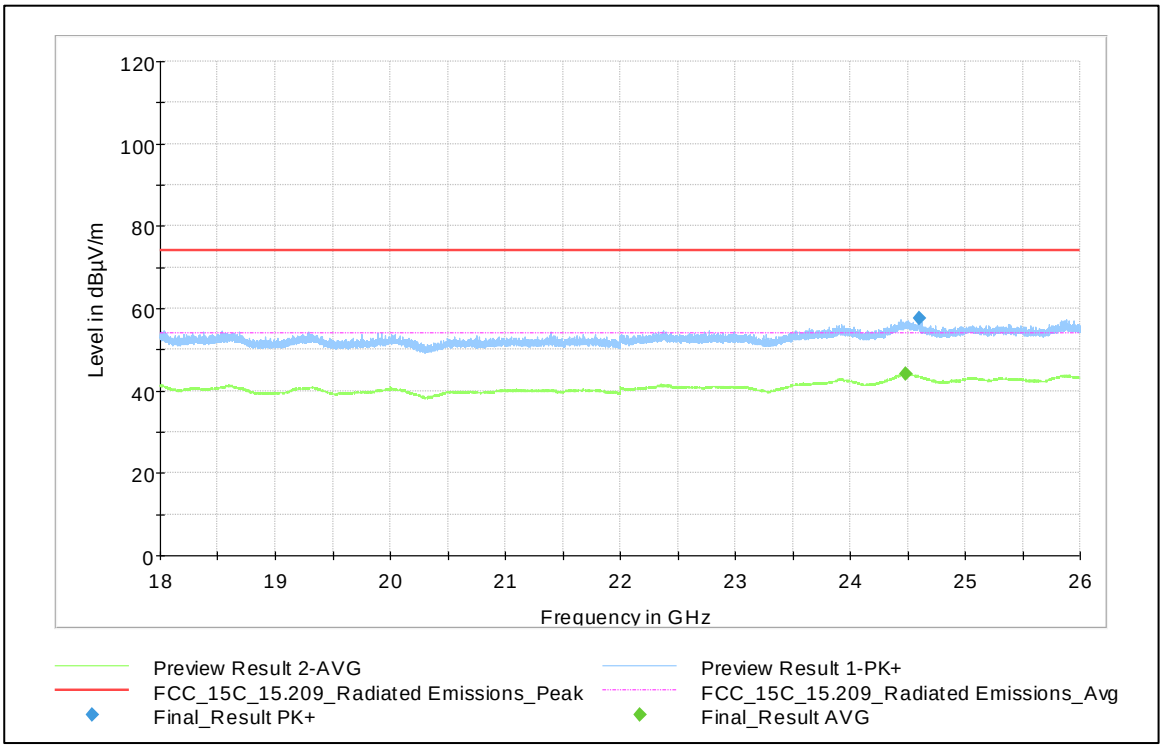
Prüfdokumentation
Test documentation

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
2402.0194	---	81.76	Fundamental Frequency					H	122.0	-17.0	12.6
2402.0259	86.65	---	Fundamental Frequency					H	124.0	-14.0	12.6
7205.8376	---	47.32	54.00	6.68	10000	1000	150.0	V	71.0	108.0	-2.9
7206.8506	57.00	---	74.00	17.00	10000	1000	150.0	V	75.0	103.0	-2.9
12722.993	---	35.79	54.00	18.21	10000	1000	150.0	V	129.0	45.0	1.9
12736.720	49.04	---	74.00	24.96	10000	1000	150.0	H	178.0	33.0	2.0
24500.500	---	44.49	54.00	9.51	10000	1000	150.0	H	198.0	1.0	23.0
24503.376	57.88	---	74.00	16.12	10000	1000	150.0	H	19.0	8.0	23.0

4.2.2.8 1 to 26GHz, Middle Channel 1Mbps



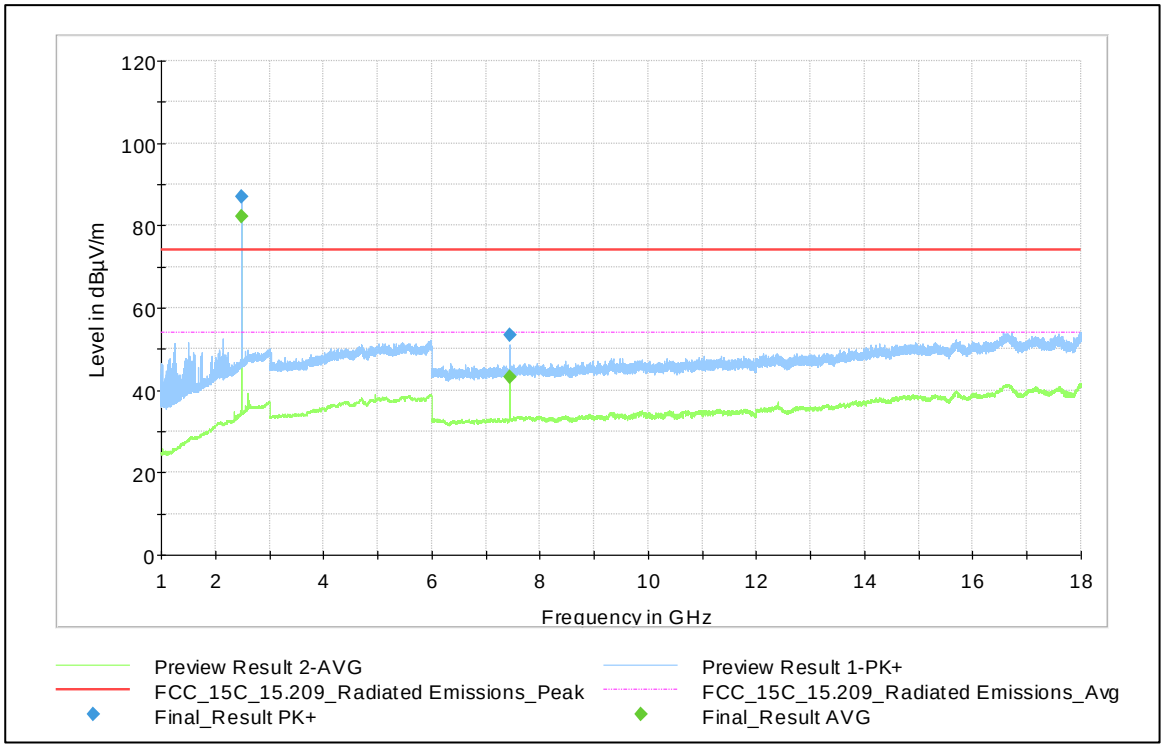
Prüfdokumentation
Test documentation

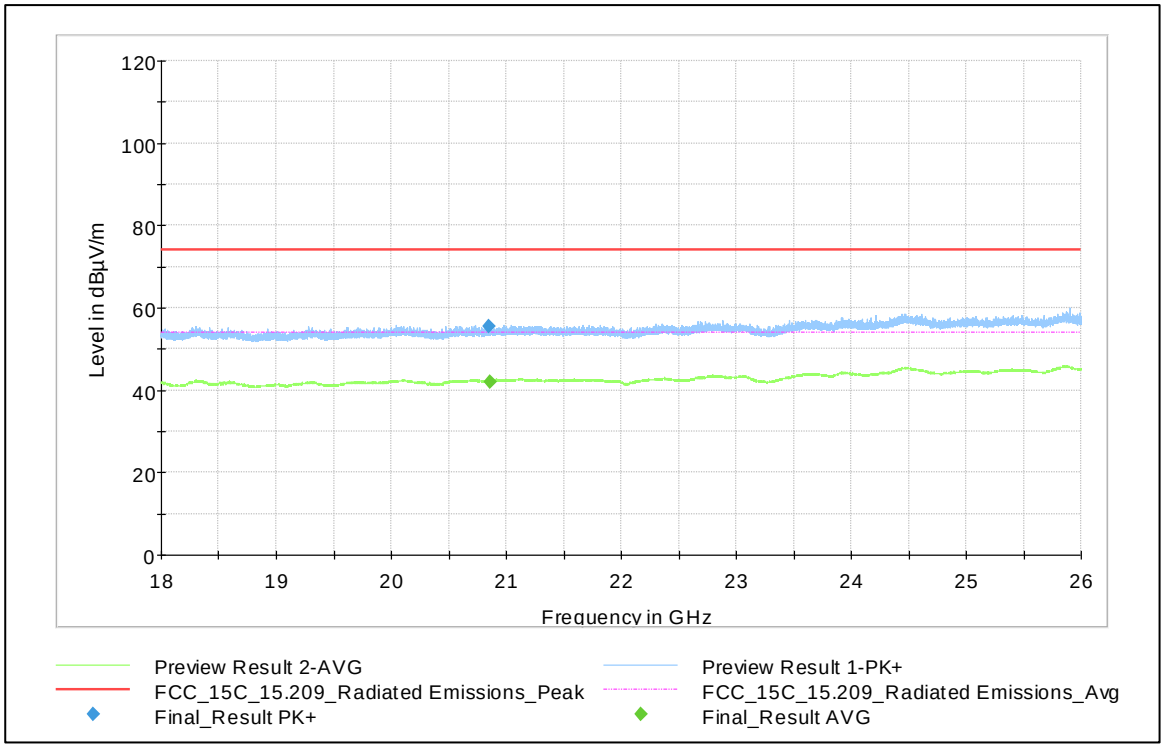


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
2440.0129	---	81.16	Fundamental Frequency				150.0	H	124.0	-13.0	13.2
2440.0389	85.84	---	Fundamental Frequency				150.0	H	122.0	-19.0	13.2
7319.2012	55.74	---	74.00	18.26	10000	1000	150.0	V	70.0	88.0	-3.1
7319.7467	---	45.41	54.00	8.59	10000	1000	150.0	V	71.0	90.0	-3.1
24482.201	---	44.14	54.00	9.86	10000	1000	150.0	H	71.0	14.0	23.0
24604.448	57.57	---	74.00	16.43	10000	1000	150.0	V	129.0	19.0	22.7

Prüfdokumentation
Test documentation

4.2.2.9 1 to 26GHz, Highest Channel 1Mbps

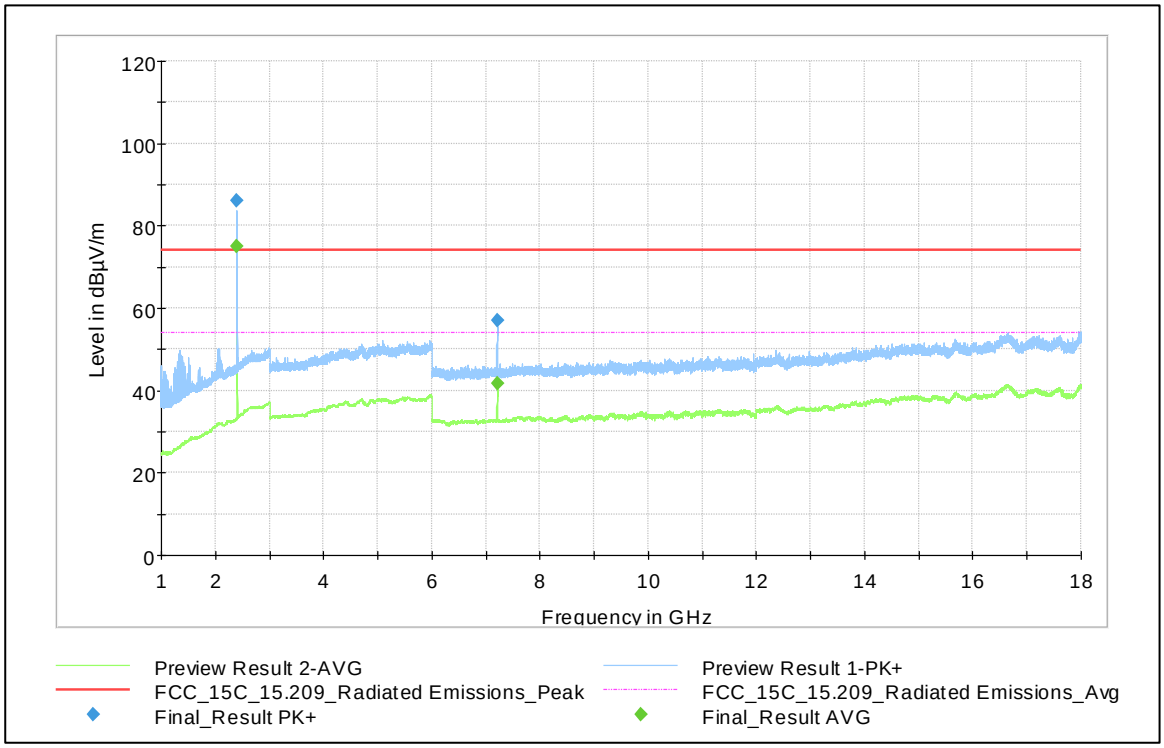




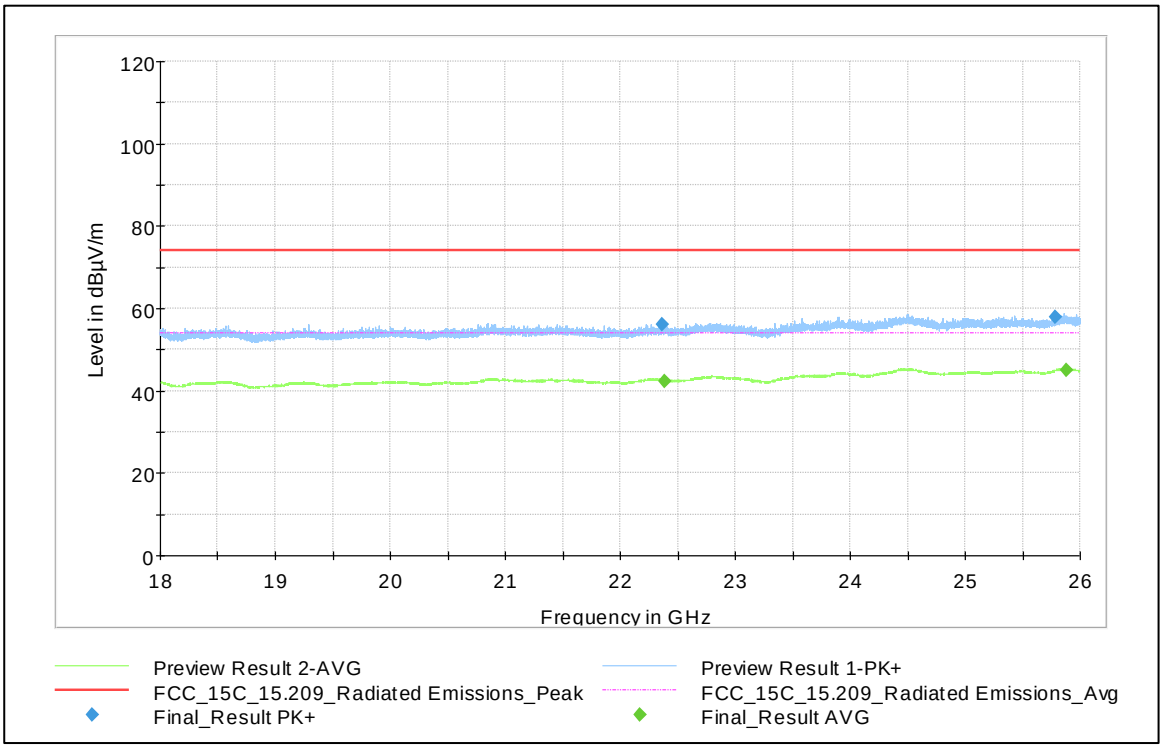
Prüfdokumentation
Test documentation

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
2479.9870	---	82.29	Fundamental Frequency				150.0	H	122.0	-20.0	13.8
2480.0000	87.10	---	Fundamental Frequency				150.0	H	124.0	-17.0	13.8
7439.5714	53.48	---	74.00	20.52	10000	1000	150.0	V	237.0	-45.0	-3.2
7439.6168	---	43.18	54.00	10.82	10000	1000	150.0	V	237.0	-45.0	-3.2
20851.454	55.44	---	74.00	18.56	10000	1000	150.0	H	102.0	102.0	20.4
20860.668	---	41.87	54.00	12.13	10000	1000	150.0	H	-19.0	45.0	20.4

4.2.2.10 1 to 26GHz, Lowest Channel 2Mbps (Worst Case test channel)



Prüfdokumentation
Test documentation



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Band width (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
2402.0259	86.14	---	Fundamental Frequency				150.0	H	124.0	-15.0	12.6
2402.0259	---	74.91	Fundamental Frequency				150.0	H	124.0	-12.0	12.6
7204.8506	---	41.85	54.00	12.15	10000	1000	150.0	V	78.0	92.0	-2.9
7206.1428	56.89	---	74.00	17.11	10000	1000	150.0	V	76.0	100.0	-2.9
22370.935	56.11	---	74.00	17.89	10000	1000	150.0	H	51.0	81.0	20.7
22385.201	---	42.26	54.00	11.74	10000	1000	150.0	H	154.0	-38.0	20.7
25783.818	57.96	---	74.00	16.04	10000	1000	150.0	V	248.0	54.0	23.2
25877.506	---	45.01	54.00	8.99	10000	1000	150.0	H	188.0	-12.0	23.4

4.2.3 Band Edge Measurement (Unwanted emissions)

4.2.3.1 Test Method

Unwanted emissions close to the operating band were additionally tested here.
Antenna connector is prepared, so conducted method was used according to ANSI C63.10:2013 clause 6.10. The maximum in-band antenna gain, or 2 dBi, whichever is greater was used outside the operating band.
The EUT was connected to the spectrum analyzer via a coax cable with a known loss. The measurements were done with EUT configured to the lowest and highest channels, and in hopping mode (in case of FHSS device).

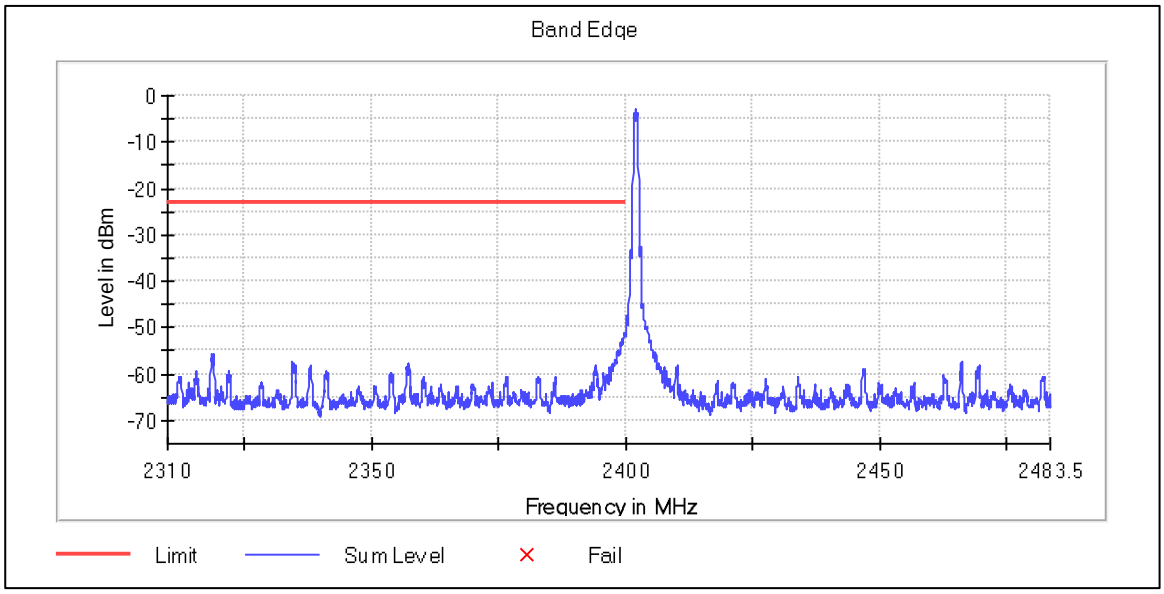
4.2.3.2 Test Setup

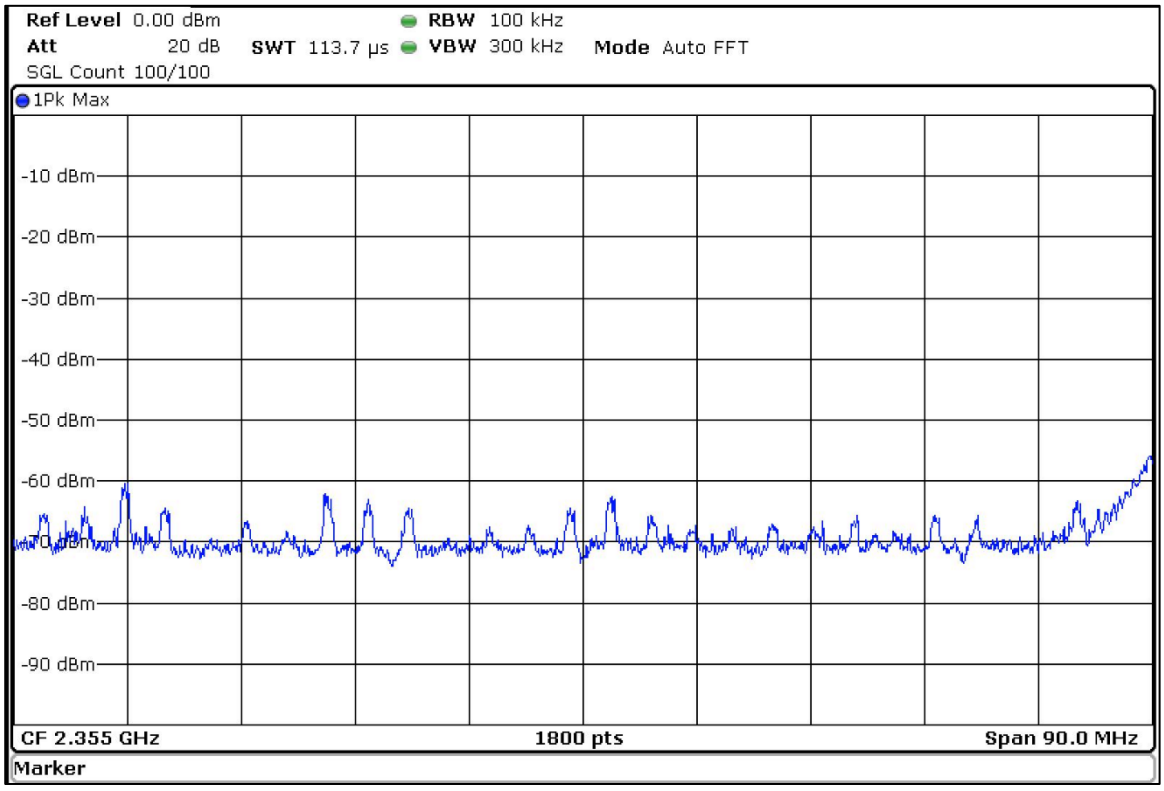
EUT		A003773899-002
Chamber details		Shielded room
Companion device		EUT in Test Mode. Therefore, no Companion Device was used.
Operation mode		☒ 1: TX-Mode; worst-case modulation ☐ 2: RX-Mode ☐ 3: TX-Modes for worst case evaluation ☐ 4: N/A
Spectrum Analyzer	**Center Frequency**	Low Band Edge:2355MHz, High Band Edge:2491.75MHz
	Resolution Bandwidth	100KHz
	Video Bandwidth	300KHz
	Span	Low Band Edge:90MHz, High Band Edge:16.5MHz
	Sweep time	Auto
Further parameters		-
Test engineer		Shrinivas Naikar

Prüfdokumentation
Test documentation

4.2.3.3 **Test results** (Unwanted emissions; Band Edge Measurement)

4.2.3.3.1 Lowest Channel 1Mbps





Prüfdokumentation
Test documentation

Inband Peak

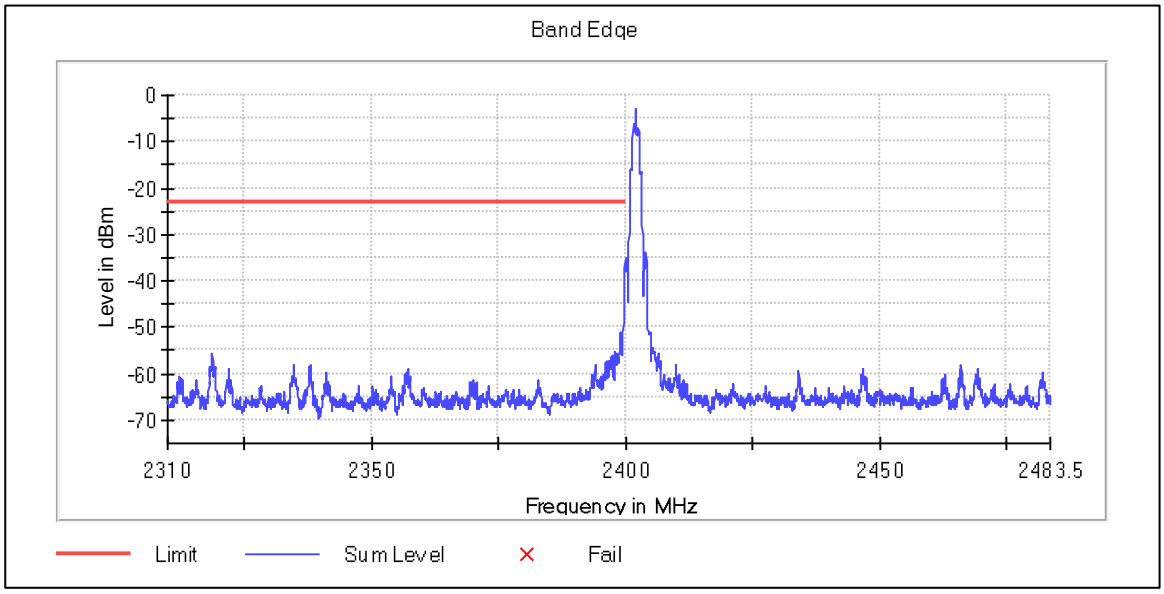
Frequency [MHz]	Level [dBm]
2402.025000	-2.9

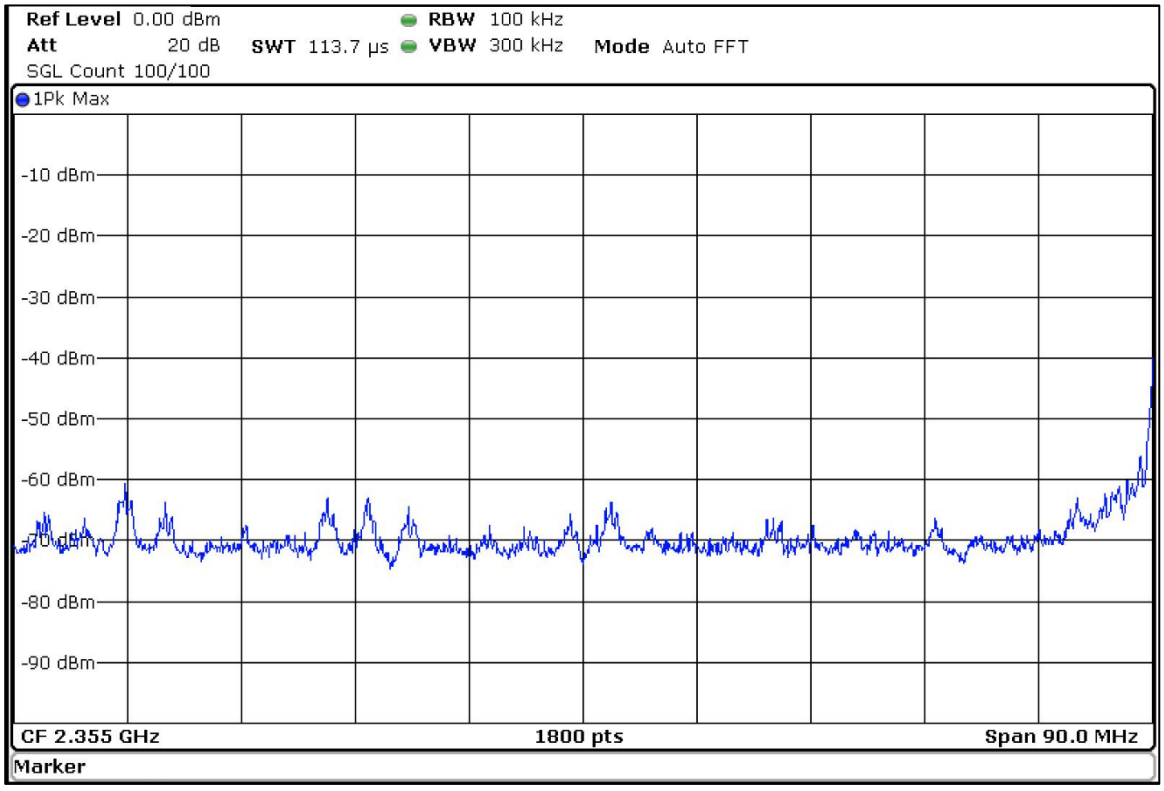
Measurements

Frequency [MHz]	Level [dBm]	Margin [dB]	Limit [dBm]	Result
2399.775000	-51.0	28.1	-22.9	PASS
2399.725000	-51.0	28.1	-22.9	PASS
2399.825000	-51.0	28.1	-22.9	PASS
2399.675000	-51.2	28.3	-22.9	PASS
2399.625000	-51.2	28.4	-22.9	PASS
2399.875000	-51.4	28.5	-22.9	PASS
2399.925000	-51.7	28.8	-22.9	PASS
2399.575000	-51.7	28.8	-22.9	PASS
2399.975000	-52.1	29.2	-22.9	PASS
2399.325000	-52.5	29.6	-22.9	PASS
2399.375000	-52.6	29.7	-22.9	PASS
2399.525000	-52.6	29.7	-22.9	PASS
2399.275000	-52.8	29.9	-22.9	PASS
2399.075000	-53.3	30.4	-22.9	PASS
2399.425000	-53.3	30.4	-22.9	PASS

Prüfdokumentation
Test documentation

4.2.3.3.2 Lowest Channel 2Mbps





Prüfdokumentation
Test documentation

Inband Peak

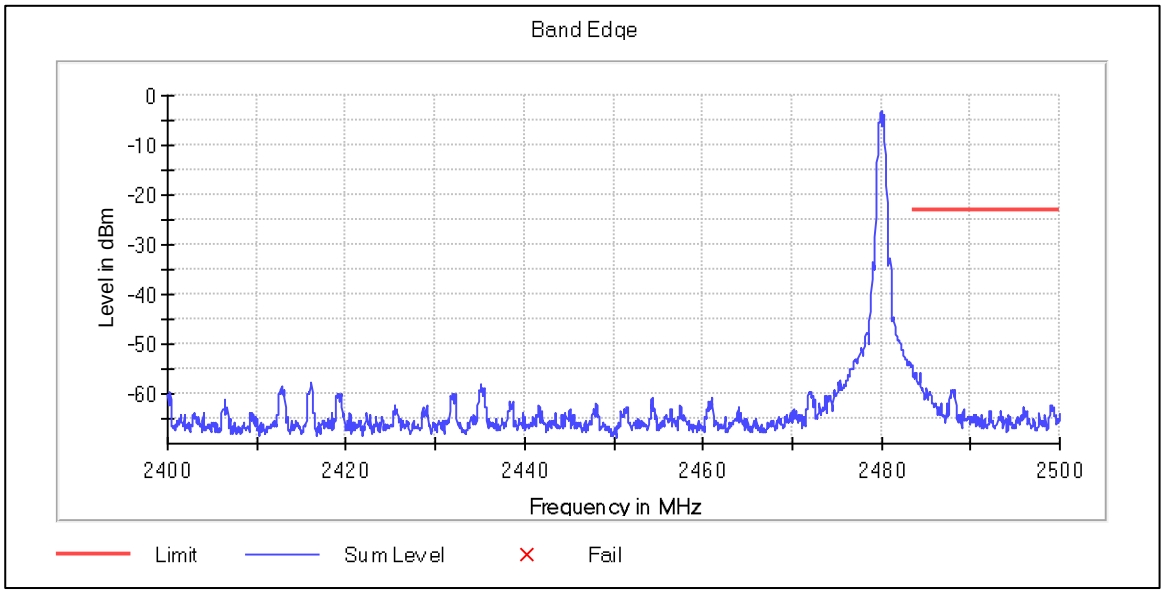
Frequency [MHz]	Level [dBm]
2402.025000	-2.9

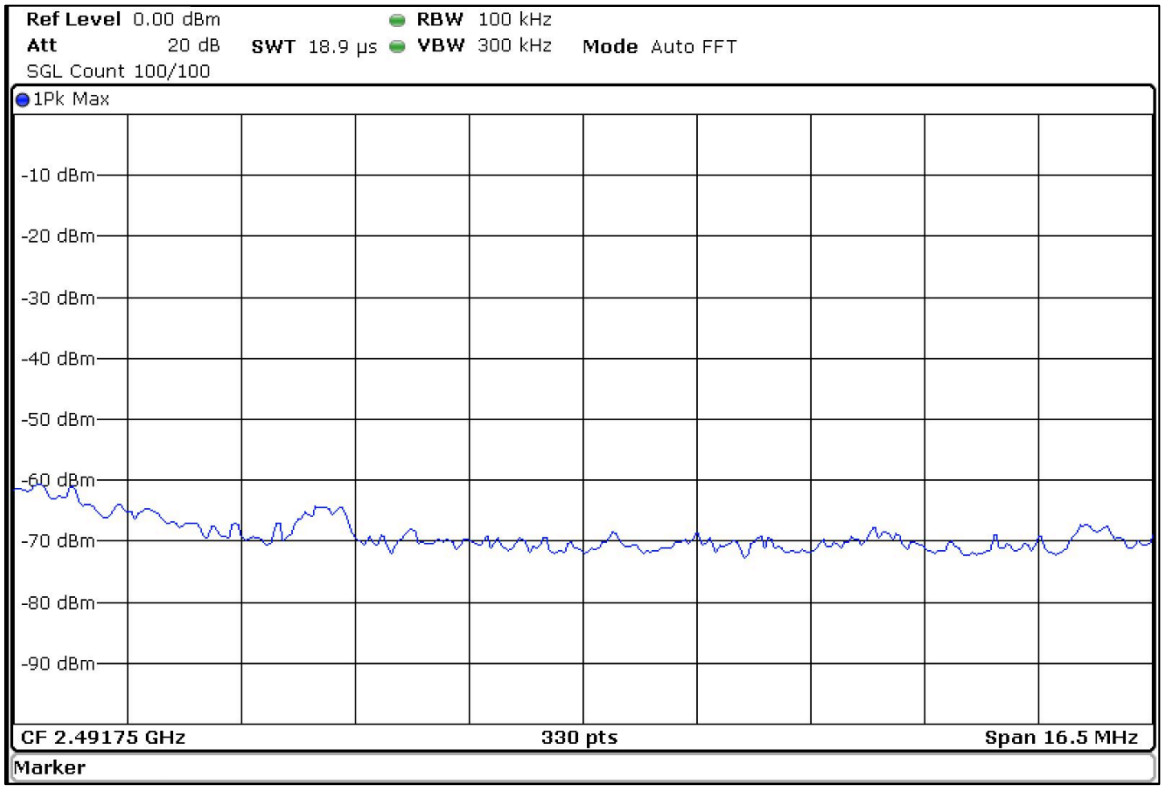
Measurements

Frequency [MHz]	Level [dBm]	Margin [dB]	Limit [dBm]	Result
2399.975000	-35.0	12.1	-22.9	PASS
2399.925000	-36.9	14.0	-22.9	PASS
2399.875000	-39.8	16.9	-22.9	PASS
2399.825000	-43.0	20.1	-22.9	PASS
2399.775000	-43.4	20.5	-22.9	PASS
2399.725000	-45.9	23.0	-22.9	PASS
2399.675000	-46.7	23.8	-22.9	PASS
2399.625000	-47.0	24.1	-22.9	PASS
2399.575000	-48.9	26.0	-22.9	PASS
2399.525000	-51.1	28.2	-22.9	PASS
2399.025000	-51.2	28.3	-22.9	PASS
2398.975000	-51.4	28.4	-22.9	PASS
2399.075000	-51.4	28.5	-22.9	PASS
2398.925000	-52.3	29.4	-22.9	PASS
2399.475000	-52.8	29.9	-22.9	PASS

Prüfdokumentation
Test documentation

4.2.3.3.3 Highest Channel 1Mbps





Prüfdokumentation
Test documentation

Inband Peak

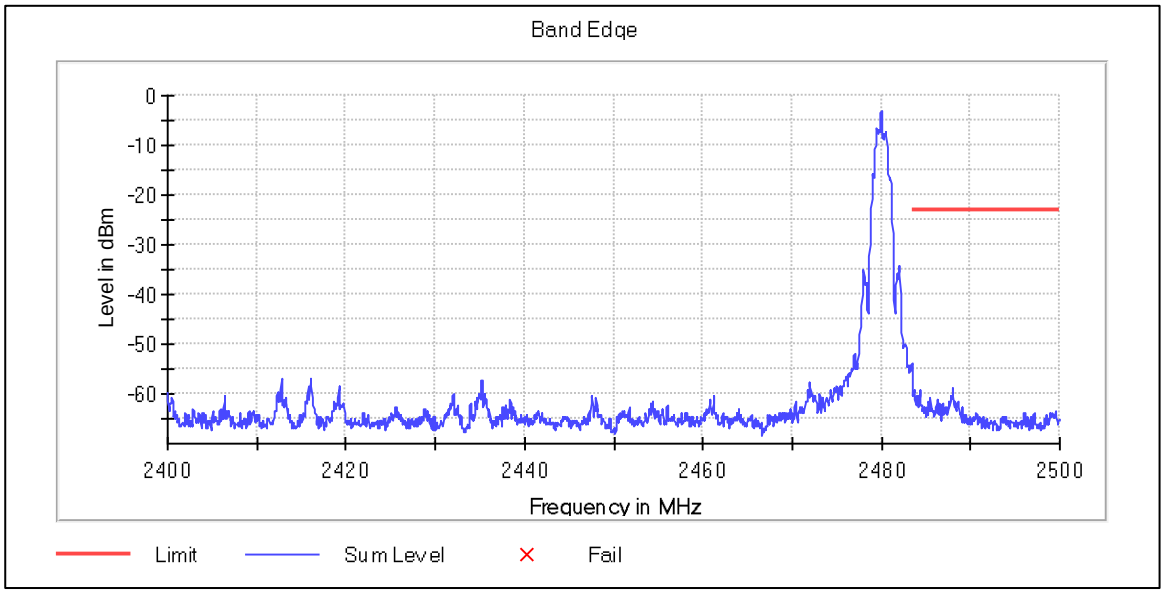
Frequency [MHz]	Level [dBm]
2480.025000	-3.2

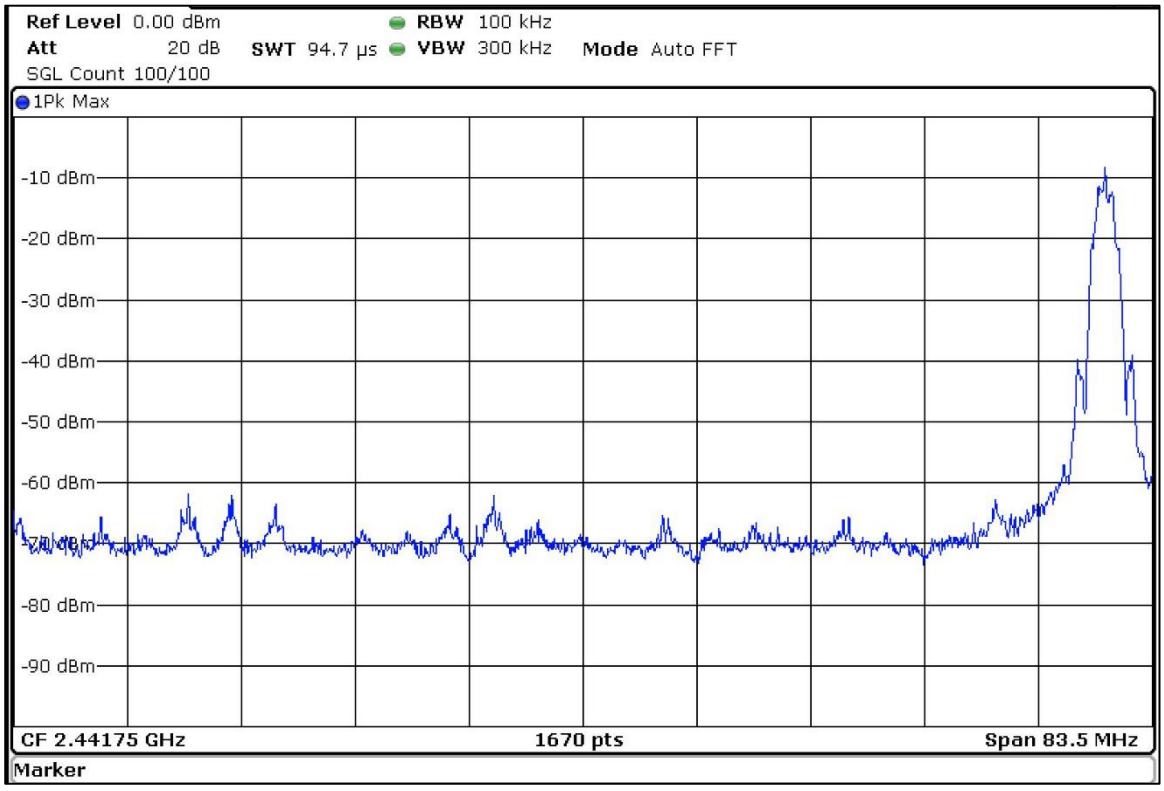
Measurements

Frequency [MHz]	Level [dBm]	Margin [dB]	Limit [dBm]	Result
2483.875000	-55.6	32.4	-23.2	PASS
2483.925000	-55.7	32.5	-23.2	PASS
2483.825000	-55.8	32.7	-23.2	PASS
2484.375000	-55.9	32.8	-23.2	PASS
2484.325000	-56.3	33.1	-23.2	PASS
2483.625000	-56.4	33.2	-23.2	PASS
2483.575000	-56.4	33.2	-23.2	PASS
2483.975000	-56.4	33.3	-23.2	PASS
2483.675000	-56.5	33.3	-23.2	PASS
2483.775000	-56.5	33.4	-23.2	PASS
2483.525000	-56.6	33.4	-23.2	PASS
2484.425000	-56.6	33.5	-23.2	PASS
2483.725000	-56.8	33.6	-23.2	PASS
2484.025000	-57.3	34.1	-23.2	PASS
2484.175000	-57.5	34.4	-23.2	PASS

Prüfdokumentation
Test documentation

4.2.3.3.4 Highest Channel 2Mbps





Prüfdokumentation
Test documentation

Inband Peak

Frequency [MHz]	Level [dBm]
2480.025000	-3.2

Measurements

Frequency [MHz]	Level [dBm]	Margin [dB]	Limit [dBm]	Result
2488.025000	-58.8	35.7	-23.2	PASS
2487.975000	-59.1	35.9	-23.2	PASS
2483.725000	-59.2	36.0	-23.2	PASS
2484.325000	-59.2	36.0	-23.2	PASS
2484.375000	-59.4	36.2	-23.2	PASS
2483.675000	-59.4	36.2	-23.2	PASS
2483.575000	-59.4	36.3	-23.2	PASS
2483.775000	-59.6	36.4	-23.2	PASS
2483.625000	-59.6	36.4	-23.2	PASS
2484.075000	-60.2	37.0	-23.2	PASS
2484.025000	-60.4	37.2	-23.2	PASS
2487.825000	-60.4	37.2	-23.2	PASS
2487.775000	-60.4	37.2	-23.2	PASS
2488.075000	-60.4	37.3	-23.2	PASS
2484.275000	-60.5	37.3	-23.2	PASS

4.2.4 Final test result

Final test result	Pass

5 Application form

The following information was provided by the customer and form the basis for the execution of the tests and the assessment of conformity. The given information can affect the results of both.

No application form was provided.

Liste der verwendeten Prüfmittel
List of used test equipment

6 Equipment List

6.1 Hardware

Prüfmittel Test equipment			Prüfmittel-Nr. / ID-Nr. Equipment No. / ID-No.	Letzte Kalibrierung Last calibration	Nächste Kalibrierung Next calibration	
TS8997	**OSP-B157 WX**. (with integrated power meter)	Rohde & Schwarz	9000266	08.09.2022	08.09.2024	
	OSP-B157W8	Rohde & Schwarz	9000267	07.09.2022	07.09.2024	
	Spectrum Analyzer: FSV-30	Rohde & Schwarz	9000268	16.07.2021	10.08.2025	
Fully Anechoic Room		Albatross Projects GmbH	2959749	08.10.2021	08.10.2024	*
Signal Analyzer FSU 26		Rohde & Schwarz	2844118	04.08.2023	04.08.2025	
RSE-Filtersystem		Rohde & Schwarz	9002802	06.02.2024	06.02.2025	*
Antenna HF907 1-18GHz		Rohde & Schwarz	2856263	01.09.2021	01.09.2024	
Horn Antenna 3116C-PA 18-40GHz		ETS LINDGREN	2900393	19.12.2022	19.12.2025	
Semi-Anechoic Chamber 30-1000 MHz		Siemens	2729645	15.06.2022	15.06.2025	
Receiver ESU 8		Rohde & Schwarz	2728844	23.02.2024	23.02.2025	
Antenna FMZB 1513-60 B (Loop) 9kHz-30MHz		Rohde & Schwarz	9058239	09.07.2021	09.10.2026	
Antenna VULB 9168 30MHz – 1GHz		Schwarzbeck	2728136	05.10.2023	05.10.2026	

*Equipment only Verified and not calibrated

6.2 Software

Test Software	Developer	Version
EMC32	Rohde & Schwarz	10.60.20
WMS32	Rohde & Schwarz	10.60.10
BAT-EMC	NEXIO	2022.0.8.0

Änderungsverzeichnis
Change history

7 Change history.

Revision Number	List of revisions	Date of issue
001	Initial Release	2024-08-12
002	Customer comment addressed in the first page	2024-09-12
Note: Latest revision report will replace all previous reports.		

Ende des Prüfberichts
End of Test Report